



SSC – CGL

COMBINED GRADUATE
LEVEL

STAFF SELECTION COMMISSION

Volume - 4

Science & Computer



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3

Chapter

Biology

The Cell

- **Simplest and most basic unit** of life.
- **Discovered:** Robert Hooke (1665)
- All living things made up of cells- **structural, functional, and biological unit of life.**
- Has the **ability to duplicate itself** on its own.
- aka "**building blocks of life.**"

Cell Structure and its components

Cell Organelles

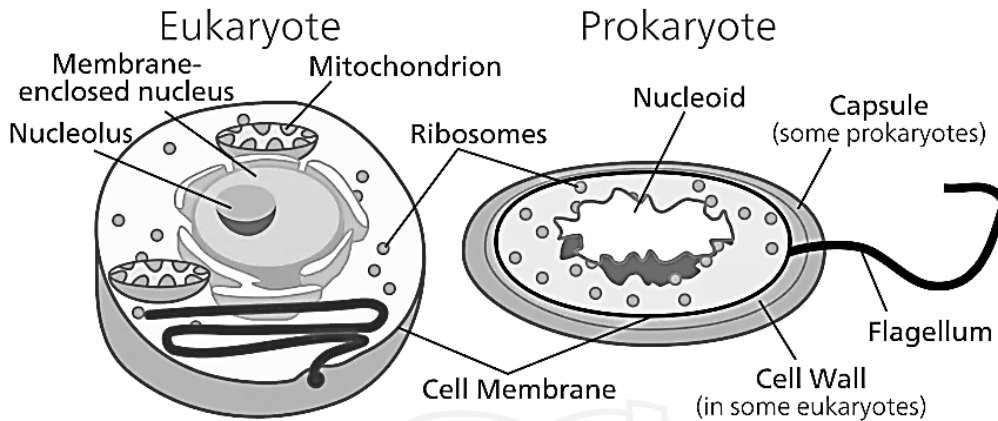
- Present within a cell & **perform certain specific functions to carry out life's processes.**

Plasma / Cell Membrane	<ul style="list-style-type: none">● Outermost covering of the cell● Separates contents of cell from its external environment.● A selectively permeable membrane as it allows entry and exit of some materials in and out of the cell.
Cell Wall	<ul style="list-style-type: none">● ONLY in plants● Outside the plasma membrane.● Mainly composed of cellulose.<ul style="list-style-type: none">○ Cellulose: A complex substance - provides structural strength to plants.
Cytoplasm	<ul style="list-style-type: none">● Jelly-like substance present between cell membrane & nucleus.● Fluid content inside plasma membrane.● Contains many specialised cell organelles (mitochondria, golgi bodies, ribosomes, etc)
Nucleus	<ul style="list-style-type: none">● Contains chromosomes that contain information for inheritance of features from parents to next generation in form of DNA● Plays a central role in cellular reproduction.● Nuclear membrane- a double-layered covering on nucleus.<ul style="list-style-type: none">○ Allows transfer of material from inside nucleus to its outside, i.e., to cytoplasm.
Nucleolus	<ul style="list-style-type: none">● Ribosome synthesis site regulating cellular activity and reproduction.
Gene	<ul style="list-style-type: none">● Unit of inheritance in living organisms.
Protoplasm	<ul style="list-style-type: none">● Entire content of a living cell [cytoplasm + nucleus].● aka living substance of the cell.
Chromosomes	<ul style="list-style-type: none">● Rod-shaped structures● Visible only when the cell is about to divide.● Contain information for inheritance of features from parents to next generation in the form of DNA (deoxyribo nucleic acid)● Composed of DNA and Protein.
DNA molecules	<ul style="list-style-type: none">● Contains information necessary for constructing and organising cells.● Functional segments of DNA - genes.

Vacuoles	<ul style="list-style-type: none"> ● Empty structure in cytoplasm ● Act as storage sacs for solid or liquid contents. ● Common in plant cells. ● Smaller in animal cells. ● Substances stored- amino acids, sugars, various organic acids and some proteins.
Endoplasmic Reticulum	<ul style="list-style-type: none"> ● A large network of membrane-bound tubes and sheets. ● 2 types : 1. Rough endoplasmic reticulum [RER] <ul style="list-style-type: none"> ○ Has ribosomes attached to its surface. ○ Ribosomes - sites of protein manufacture. 2. Smooth endoplasmic reticulum <ul style="list-style-type: none"> ○ Helps in the manufacture of fat molecules, or lipids, important for cell function. ○ Some of these proteins and lipids help in building the cell membrane k/a membrane biogenesis. ● Serve as channels for transport of materials between various regions of cytoplasm or between the cytoplasm and the nucleus. ● Also functions as a cytoplasmic framework providing a surface for some biochemical activities of cells.
Golgi Apparatus/ Complex	<ul style="list-style-type: none"> ● A system of membrane-bound vesicles arranged parallel to each other in stacks called cisterns. ● Packages and dispatches material synthesised near ER to various targets inside and outside the cell. ● Stores, modifies and packages products in vesicles. ● Involved in the formation of lysosomes. <ul style="list-style-type: none"> ○ Membrane-bound sacs filled with digestive enzymes. ○ Kind of waste disposal system of the cell. ○ Help to keep the cell clean by digesting any foreign material as well as worn-out cell organelles.
Mitochondria	<ul style="list-style-type: none"> ● Aka powerhouse of the cell. ● Energy required for various chemical activities is released by mitochondria in the form of ATP (Adenosine Triphosphate) molecules. ● 2 membranes: <ul style="list-style-type: none"> ○ Outer membrane- porous ○ Inner membrane - deeply folded. <ul style="list-style-type: none"> ■ Folds create a large surface area for ATP-generating chemical reactions.
ATP	<ul style="list-style-type: none"> ● aka energy currency of the cell. ● Body uses energy stored in ATP for making new chemical compounds and for mechanical work.
Ribosomes	<ul style="list-style-type: none"> ● Site of protein synthesis. ● Polyribosomes or Polysomes: Several ribosomes may attach to a single mRNA and form a chain. ● Prokaryotes- ribosomes are associated with the plasma membrane of the cell.
Cilia and Flagella	<ul style="list-style-type: none"> ● Hair-like outgrowths of the cell membrane. ● Cilia - small structures which work like oars, causing the movement of either the cell or the surrounding fluid. ● Flagella - comparatively longer and responsible for cell movement.

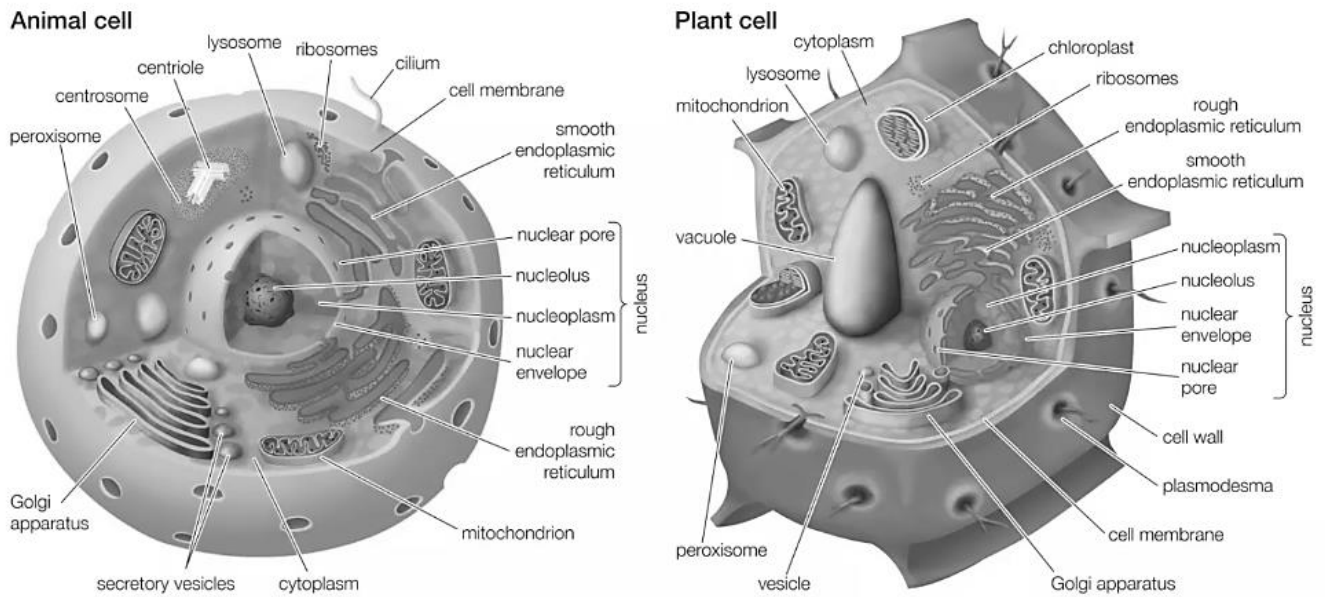
	<ul style="list-style-type: none"> ● Prokaryotic bacteria have flagella but structurally different from eukaryotic flagella.
Centrosome and Centrioles	<ul style="list-style-type: none"> ● Centrosome- an organelle usually containing 2 cylindrical structures called centrioles. ● Surrounded by amorphous pericentriolar materials. ● Both the centrioles in a centrosome lie perpendicular to each other

Types of Cells



Prokaryotic Cell	Eukaryotic Cell
● Primitive/undeveloped nucleus.	● Has true or developed nucleus
● Size - 0.2 - 2.0 micrometers	● Size- 10- 100 micrometers.
● Simpler in structure	● More complex
● Organelles not membrane-bound	● Organelles membrane bound & specific in function.
● DNA arranged in circular shape	● DNA linear in shape
● Cytoplasm present, but lacks in most cell organelles.	● Consists of both cytoplasm and organelles
● Cell wall present. ● Made of mucopeptide or peptidoglycan	● Usually, absence of cell wall here. ● Made of cellulose
● Cell division - binary fission, transduction, conjugation, and transformation	● Cell division - mitosis
● Mitochondria absent	● Mitochondria present.
● Endoplasmic reticulum not present.	● Endoplasmic reticulum present.
● Ribosome present	● Ribosome present
● Plasmids commonly found. ○ A small, circular, double-stranded DNA molecule distinct from a cell's chromosomal DNA. ○ Naturally exist in bacterial cells.	● Plasmids very rarely found
● Only asexual reproduction.	● Both sexual and asexual reproduction.
● Have a single origin of replication	● Have multiple origins of replication
● Only 1 chromosome.	● Many chromosomes present
● Eg. Bacteria and Archaea.	● Eg. Plant and animal cells.

Plant and Animal Cells



	Animal Cell	Plant Cell
Nucleus	Present	Present
Cilia	Present	Very rare
Shape	Round (irregular shape)	Rectangular (fixed shape)
Chloroplast	NO chloroplasts	Chloroplasts present
Cytoplasm	Present	Present
Endoplasmic Reticulum	Present	Present
Ribosomes	Present	Present
Mitochondria	Present	Present
Vacuole	One or more small vacuoles (much smaller than plant cells).	One large central vacuole taking up 90% of cell volume.

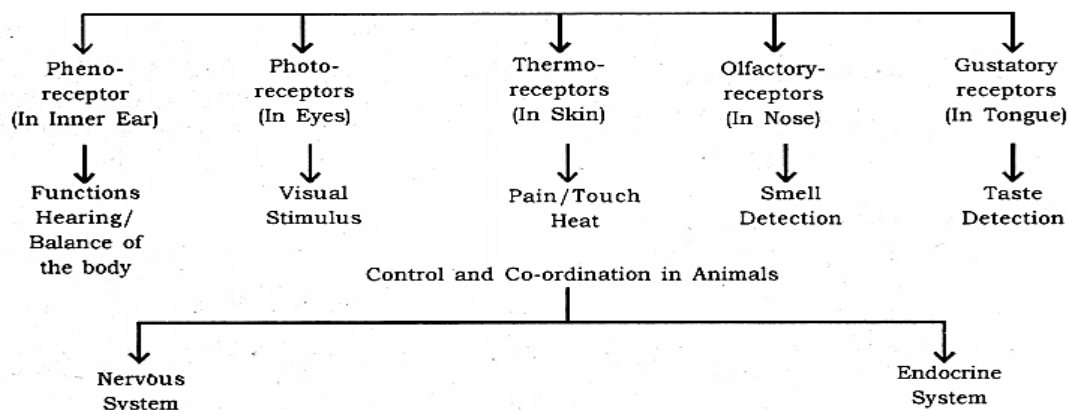
Control and Coordination

In animals

Nervous system and hormonal system are responsible for control and coordination.

Receptors:

- Specialized tips of nerve fibres that collect information to be conducted by nerves.
- In the sense organs of the animals.



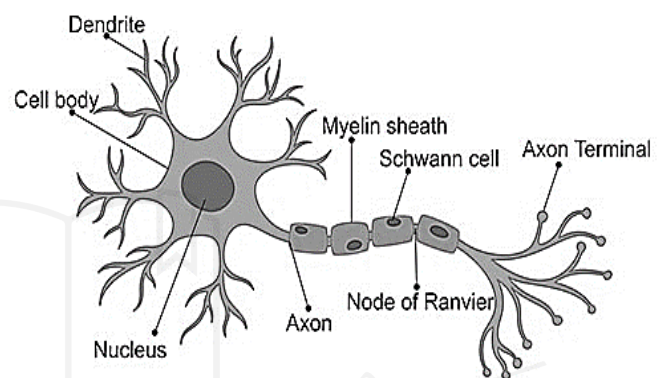
- **Types:**

1. **Nervous System**

- A **highly complex regulatory system** in animals.
- **Coordinates actions & transmits sensory information and signals** to/from the different parts of body.
- **Neuron - structural and functional unit** of entire system.
- **Functions:**
 - **Receives information** from the **environment**.
 - Receive the information from the **various body parts**.
 - **Act accordingly** through muscles and glands.
- **Movement- ability** of an organism **to move a particular body part**.
- **Locomotion - ability** of an organism **to move its whole body** from one place to another.

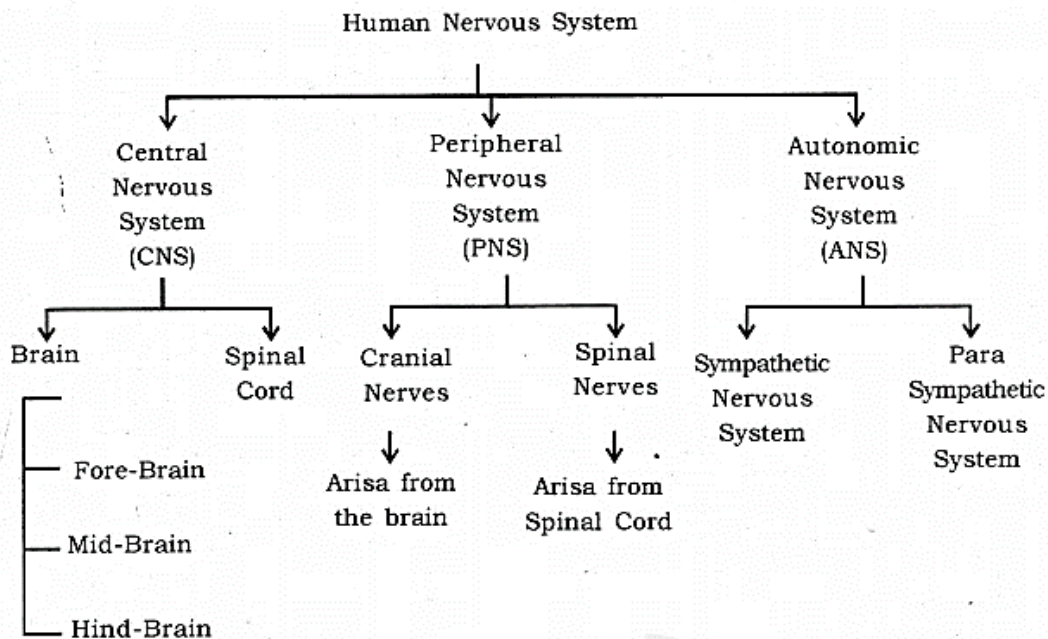
Neuron

- **Structural and functional unit of the nervous system**
- **Coordinates and controls the complex actions** in animals.
- **Specialized cells** responsible for **transmission of nerve impulses**.
- **3 parts-**



1. **Axon-**
 - **Tail of the neuron**.
 - **Ends in fine hair-like structures k/a axon terminals** which rely on nerve impulses
 - **Axons - myelinated or unmyelinated**.
 - **Impulse transmission** is faster in **myelinated neurons**.
 2. **Cyton/soma/cell body-**
 - **Star-shaped** having various **hair-like structures k/a dendrites** which **receive the nerve impulses**
 3. **Myelin Sheath-**
 - An **insulating sheath** on **axon**.
 - **Insulates axon against nerve impulse** from its **surroundings**.
 - **Dendrites receive the impulse** from other neurons.
 - **Cyton or Soma cells process the impulse- transmitted** to the **Axon**. Gets transmitted either to other neurons or to muscles for taking necessary action.
- **Types :**
 1. **Sensory neurons-** Receive the signals from a sense organ
 2. **Motor neurons-** Send the signals to a gland or muscle
 3. **Relay or association neuron-** Relay signals between a motor neuron and sensory neuron.
 - **Synapse**
 - A **microscopic gap** between **two adjacent neurons**.
 - A **point contact between terminal branches** of **axon** of one neuron and with the dendrite of another neuron.
 - **Convert electric signals** into **chemicals** that can cross over gap between axon and dendrite.
 - **Chemical message** is **passed to next neuron** and **converted back** to the **electrical signal** for **interpretation**.
 - **Neuromuscular Junction:**
 - **Point where a muscle fibre comes in contact with a motor neuron** carrying nerve impulse from the control nervous system.

Human nervous system



1. Central Nervous System:

- Brain + spinal cord.
- Brain controls all the functions in the human body.
- Spinal cord works as relay channel for signals between brain and peripheral nervous system.

Human Brain

- A highly complex organ mainly composed of nervous tissue.
- Tissues highly folded to accommodate a large surface area in less space.
- Covered by a 3-layered system of membranes k/a meninges.
- Cerebrospinal fluid filled between meninges cushions the brain against mechanical shocks.
- 3 parts:

1. Fore-brain:

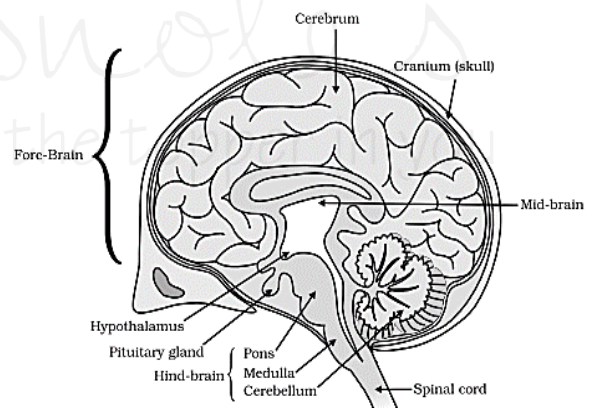
- Composed of the cerebrum.
- Cerebrum- Largest part in human brains.
- Divided into 2 hemispheres k/a cerebral hemispheres.
- Functions:
 - Controls voluntary motor actions.
 - Site of sensory perceptions, like tactile and auditory perceptions.
 - Site of learning and memory.

2. Mid-brain:

- Composed of the hypothalamus.
- Hypothalamus- lies at the base of the cerebrum.
- Controls sleep and wake cycle (circadian rhythm) of the body.
- Controls the urges for eating and drinking.

3. Hind-brain:

- Composed of cerebellum, pons, medulla, oblongata.
- Cerebellum- lies below cerebrum and at back of whole structure.
 - Coordinates the motor functions.
 - Eg. riding a bicycle, ensures perfect coordination between pedalling and steering control.
 - Controls posture and balance.
 - Controls the precision of voluntary action.



- **Medulla: Forms brain stem**, along with the pons.
 - **Lies at the base of brain** and **continues** into **spinal cord**.
 - **Controls various involuntary functions**, like hear beat respiration, etc.
 - **Controls involuntary actions**.
 - **Eg:** Blood pressure, salivation, vomiting.
- **Pons:**
 - **Relays impulses** between **lower cerebellum** and **spinal cord**
 - **Regulates respiration**.

Spinal cord:

2. **Controls reflex actions** and conducts messages between different parts of body and brain.

3. **Reflex Action:**

4. **Sudden and involuntary response** to **stimuli**.

5. **Helps organisms to quickly adapt** to an **adverse circumstance** that could cause bodily harm or even death.

6. **Eg.** Pulling our hands away immediately after touching a hot or cold object.

7. **Reflex Arc:**

8. **Path** through which nerves signals, **involved** in a **reflex action**, travel.

Receptor → **Sensory neuron** → **Relay neuron** → **Motor neuron** → **Effector** (muscle)

9. **Peripheral Nervous System:**

- **Cranial nerves + spinal nerves.**
- **12 pairs of cranial nerves** coming out of brain and go to the organs in the head region.
- **31 pairs of spinal nerves** coming out of spinal cord and go to the organs which are below the head region.

10. **Autonomous Nervous System:**

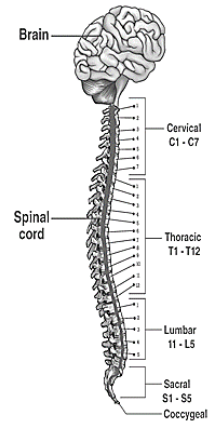
- **Composed of a chain of nerve ganglion** which **runs along spinal cord**.
- **Controls all the involuntary actions** in the **human body**.
 - **2 parts :**

A. Sympathetic Nervous System:

 - **Increases activity** of an **organ** as required.
 - **Eg.** during running, there is an increased demand for oxygen by the body - fulfilled by an increased breathing rate and increased heart rate.

B. Parasympathetic Nervous System:

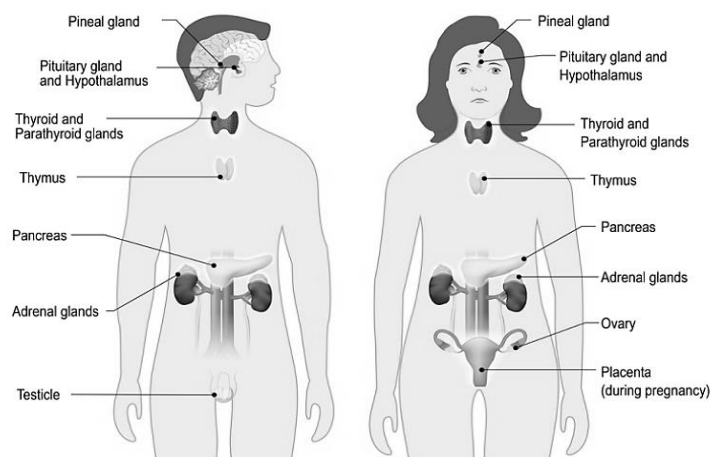
 - **Decreases the activity** of an organ and thus has a calming effect.
 - **Eg.** during sleep, breathing rate slows down and so does the heart rate.
 - Helps in the **conservation of energy**.



2. **Endocrine System**

- **Made up of interconnected glands** that create **hormones**.
- Almost **every cell, organ, and function in our body is influenced by the endocrine system**.
- **Aids** - regulation of mood, growth and development, tissue function, metabolism, and sexual and reproductive functions.
- Also k/a **ductless system** as the endocrine glands **secrete** their **hormones** directly into **bloodstream**.

ENDOCRINE SYSTEM



4

CHAPTER

Introduction to Computer

- Computer is a fast Working electronic machine, which accepts the input information and data in electronic form and processes it according to pre-stored instructions, provides desired output.
- It is also called computer in Hindi.
- The word 'computer' is derived from the word 'compute', which means 'to calculate'.
- Abacus -In ancient times, the device that taught counting was called Abacus.
- John Napier developed the logarithm.

Machine Development

- The Pascal calculator was the first machine calculator, invented by Blaise Pascal (Mathematician from France).

- **ENIAC** - Electronic Numerical Integrator and Computer) It is also called the first digital computer.
- Charles Babbage is called the creator or father of the modern computer.

Generations of Computers

First Generation (1942-55)

- In this vacuum tubes or vacuum valves were
Used.
- The first stored program computer was developed by Morris Wilkies (England) in the form of EdSec.

Generations	Hardware/Technology	Memory Device	Programming Language	Examples
I (1942-55)	Vacuum Tube	Magnetic Disks, Input, Output Pentacards	Machine Language/ Binary Language	ENIAC, UNIVAC
II (1955-64)	Transistor	Magnetic Core, Magnetic Tape	Assembly Language, High Level Language (COBOL & FORTRAN)	IBM – 2000 CDC – 360
III (1965-70)	IC (Integrated Circuit)	Magnetic Core (Floppy Disk)	Compiler Language (1972-'C' Language)	IBM – 320
IV (1971-85)	VLSI – Very Large Scale Integration SSI – Small Scale Integration LSI – Large Scale	CD (Compact Disk)	IV Generation Language	IMAC (Siddarth)

	Integration Micro processor, Use of Micro Computer			
V (1985, till now)	ULSI (Ultra Large Scale Integration (Artificial intelligence)	DVD/PD/Memory Card / BRD	Natural Language	Laptop/ Tablet

Second Generation (1955-64)

- In 1947, William "Cockley" of Bell Laboratory (USA) developed 'Transistor' (PNP or NPN semiconductor device).
- In this generation computers, input and output devices were more convenient.
- To avoid the complexity of the first generation developed machine and assembly language, simple computer language i.e. high level language was developed in the second generation.
- Computers became smaller and cheaper in size with the use of transistors instead of vacuum tubes.
- Computer languages like FORTRAN, COBOL etc. developed.

Third Generation (1965-70)

- Developments in electronic technology made it possible to make a small silicon chip.
- This new technology is called Integrated Circuit or Integrated Circuit.
- With this generation of computers, external devices for storing data such as discs, tapes, etc. were developed.
- ICL 2903, ICL 1900, UNIVAC 1108 and System 1360 were prominent among the computers of this generation.

Fourth Generation (1971-1985)

- ICs were further developed in this generation, which are called massive integrated circuits.
- With this invention, the entire central processing unit came in a small chip, which is called a microprocessor.
- ALTAIR 8800 was the first microcomputer, which was made by a company called MITS.
- With the arrival of the fourth generation, the size of the computer became very small and the memory increased a lot.

Fifth Generation (1985, till now)

- In this the use of Ultra Large Scale IC (ULSIC) started, in which circuits equivalent to millions of transistors were made on a small chip.
- ULSIC (Ultra Large Scale Integrated Circuit) was created by upgrading the VLSIC chip in the internal electronic circuit of the computer, due to which the size of the microcomputer is getting smaller day by day.
- Today computers are available in different models desktop, laptop, palmtop etc.

- Internet, multimedia developed in this generation.
- Development of new application, artificial intelligence has made great progress in this area.

Classification of Computer

Classifications of Computer	
Based on Technology	Based on Efficiency and Capacity
(i) Digital Computer	(i) Mainframe computer
(ii) Analog computer	(ii) Mini computer
(iii) Hybrid	(iii) Micro Computer
(iv) Optical Computer	(iv) Super computer.

Based on Technology

2. Digital/Numerical Computer

- In these computers, information and data are represented in a discrete form as a fixed number 0 or 1.
- This computer expresses each action or activity in 'Yes' (i.e., 1) and 'No' (i.e., 0) and acts accordingly.
- Binary digital system is used in digital machines.

3. Analog Computer

- Those computers in which various physical quantities such as pressure, temperature, length etc. keep changing continuously.
- These computers measure an amount on the basis of mutual comparison.

4. Hybrid Computer

- Both analog and digital computers are used in hybrid computers.
- While calculating, some parts are calculated on analog computer and some on digital computer.

5. Optical Computer

- The computing devices in these are made based on the optical method.
- A medium such as a wire is not required for the conduction of light.

Based on Efficiency and Capacity

1. Mainframe Computer

- It was as huge as the size of a room.
- Its specialty was that more than 100 people can work together in this computer.

2. Mini Computer

- Minicomputers are cheaper, less powerful and of medium size as compared to mainframe computers.
- They are often used in laboratories and commercial organizations.

3. Micro Computer

- These are small computers.
- They are cheap in price and small in size, so they can be taken home or outside for personal use, they are also called personal computers or PCs

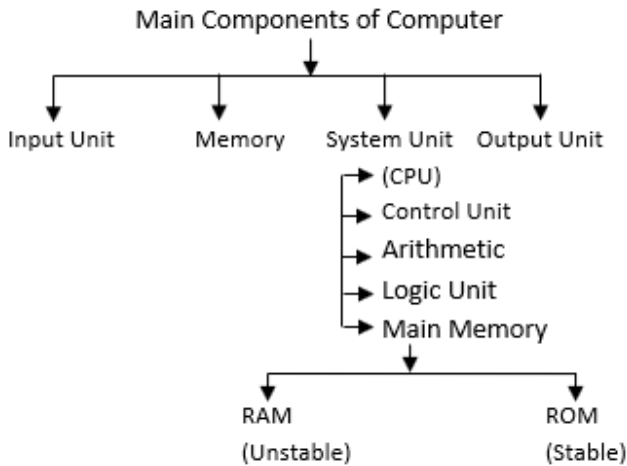
4. Super Computer

- It is very powerful, dynamic and its memory capacity is also very high.
- The working capacity of super computer is more than 500 megaflops.
- They are used in weather forecasting, scientific and space related research, molecular modulating, physical simulation, military agencies, etc.
- Multiple CPUs work in parallel order in a super computer.
- The world's first supercomputer research company had created 'CRAY K.I.S' in the year 1979.

5

CHAPTER

Computer Working System, Input, Output and Storage

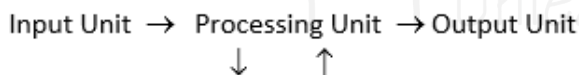


1. Input Unit

- It is the unit of the computer that receives input in the form of data and commands.

2. Storage

- This unit is used to store the processed data temporarily and the provided output permanently.



(Data + Instruction) Memory Unit (Information)

Memory can be divided into two parts -

- Primary or Main Memory
- Secondary or Auxiliary Memory

3. System Unit

- Its function is to process the given data and extract information from it in the form of output, it is also called CPU (Central Processing Unit).
- It is also called the brain or heart of the computer.
- It is mainly divided into two parts –

(i) A.L.U (Arithmetic and Logic Unit)

- All the arithmetic and logical calculations occurring in a computer are done by this unit.
- ALU Control Unit - Can calculate on any data according to the instructions given by it.
- Logical calculations are meant for addition, subtraction, multiplication, division, etc.

Note – AND, OR, NOT etc. are called Boolean operators, which are used to perform logical calculations.

(ii) CU - Control Unit

- All types of activities happening in a computer are controlled by this unit.
- The control unit provides a variety of instructions to the ALU to perform calculations.
- The control unit also performs the task of bringing the processed data in the main memory to the processor.

Storage Unit

- The word to be processed in the computer is 0 or 1 as a binary digit, is denoted.
- Binary digit 0 or 1 is defined by bit (binary digit) or letter or character.
- A word in a computer is made up of 8 bits, which is called a byte.
- The smallest unit of memory in a computer is a bit (bit).

4 Bit = 1 Nibble

8 Bit = 1 Byte

$2^{10} - 1024 \text{ Byte} = 1 \text{ KB (Kilo byte)}$
 $= 1000$

$2^{20} - 1024 \text{ KB} = 1 \text{ MB (Mega byte)}$
 $= 1000^2$

$2^{30} - 1024 \text{ MB} = 1 \text{ GB (Giga byte)}$
 $= 1000^3$

$2^{40} - 1024 \text{ GB} = 1 \text{ TB (Tera byte)}$
 $= 1000^4$

$2^{50} - 1024 \text{ TB} = 1 \text{ PB (Penta byte)}$
 $= 1000^5$

$2^{60} - 1024 \text{ PB} = 1 \text{ EB (Exa byte)}$
 $= 1000^6$

$2^{70} - 1024 \text{ EB} = 1 \text{ ZB (Zetta byte)}$
 $= 1000^7$

$2^{80} - 1024 \text{ ZB} = 1 \text{ YB (yotta byte)}$
 $= 1000^8$

Ascending Order -

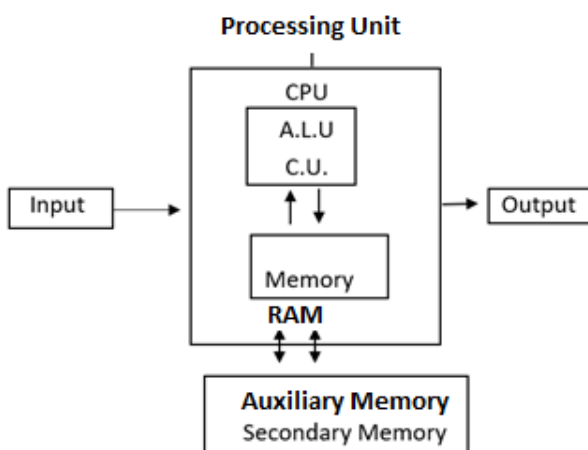
Bit < Byte < KGB < MB < GB < TB < EB < ZB < YB

$1024 \text{ KB} = 2^{23} \text{ Bit}$

$= 1024 \times 1024 \times 8$

$= 2^{10} \times 2^{10} \times 2^3$

$= 2^{23}$



- Processor has Resistor and System Clock in addition to ALU and CU.

4. Output Unit

- The user receives the processed results through the output itself.

- Examples of some output devices are monitors, printers, speakers, pen drives, etc.

Input and Output Devices

Input Device

- Input devices are used to input data, instructions, information etc. into the computer.
- Input devices also work to encode data, with the help of which the data can be processed in the computer.

Note - The data going into the computer is called input.

Input $\xrightarrow{\text{Encoder}}$ Binary / Machine Language $\xrightarrow{\text{Decoder}}$ Output (Information)
(Data + Instruction) [11000000] 0 or 1 (11000000)
(Processor)

Input devices are:-

1. Key Board (101 – 108) / QWERTY

- These are the most popular input devices for inputting into the computer.
- With the help of key-board, data and instructions can be entered in the computer.
- Keyboard is an input device based on typewriter.
- Keyboard is a device acting like an encoder, which works to convert the input data into 0 or 1 binary digit.
- By pressing and holding a key on the keyboard for 0.5 seconds, the letter of the key is input evenly, this process is called typomatic.
- **Different types of keys** -
 - (i) Numeric Keys (0 से 9) = To input the numbers.

(ii) Alpha Keys (A से Z) = To input the alphabets.

(iii) Function Keys [F₁ से F₁₂] = Total = 12

F₁ = Help

F₂ = Rename

F₃ = Search

F₄ = Redo

F₅ = Refresh/Slide Show

F₆ = To move the cursor to the address bar in an Internet browser.

F₇ = For grammar and spelling errors.

F₁₂ = Save as

(iv) Toggle Key – The key having (On) and Off (Off) features in the keyboard is called (Toggle Key).

(a) Num Lock – This key is used to use the arrow key present on the numeric pad.

(b) Caps Lock – This key is used to input capital letters.

(c) Scroll Lock – With the help of this key, moving forward and backward in the document is stopped at a particular place.

(v) Modifier Key/Combination Key -

(a) Alt (Alter)- 2

(b) Ctrl (Control) -2

(c) Shift (Shift) – 2

(vi) Navigation Key

(a) Arrow Key

(b) Page up (To go to the first page)

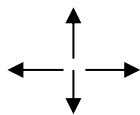
(c) Page down (To go to the next page)

(d) Home (To go to the first page of the document)

(e) End (To go to the last page of the document)

(vii) Special Character Key –[* # & \$]

(viii) Special Key



(a) Space bar – To leave space between the two words.

(b) Tab Key – Pressing the Tab key in MS Word moves the cursor forward 0.5 inches.

(c) Back Space – It is used to erase the letter from the left side.

(d) Delete – To erase the letter from the right side is used.

(e) Enter – With the help of this key, a new line or a new paragraph is started in a document.

(f) Window – Pressing it activates the start button.

Numeric Keypad Key-Board

- This is a set of 17 keys on the right side of the keyboard.
- The second row of the key board is called ASDFGHJKL Home Key.

2. Pointing Device

- That input device in which a pointer, called a cursor, is used to provide data and instructions.

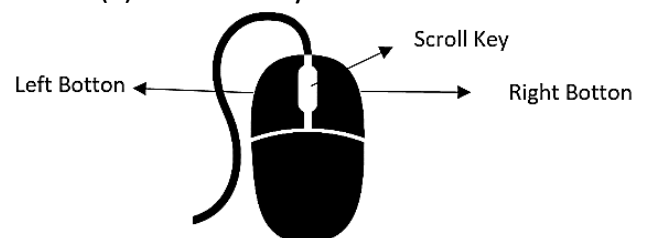
(i) Mouse-

- Mouse is used to operate in the computer.
- Mouse mainly consists of two or three buttons which are pressed to perform an action and this action is called click.
- Mouse has various buttons.

(a) Left button

(b) Right button

(c) 3 Scroll Key



- On the basis of technology, the mouse is divided into 2 parts -
 - 1- Mechanical Mouse
 - 2- Optical Mouse
 - (ii) Touchpad** - This pointing device is used in laptop instead of mouse.
 - (iii) Joystick** - This device is used to move the pointer at a faster speed. It is mainly used for learning computer games.
 - (iv) Light Pan** - This device is used for designing works, so it is used for CAD (Computer Added Design).
 - (v) Trackball** - This device is mainly used where there is not much space available to move the cursor.
- 3. Scanner**
- This device is used to convert a hard copy into a soft copy.
 - Both text and graphics can be scanned with the help of Scanner.
- 4. Microphone/Mic/Speech Recognition System**
- This device is used to provide data in the form of voice to the computer.
- 5. Biometric Sensor**
- This device is used to input traces of various biological parts of human beings in the computer.
- 6. BCR (Barcode Reader)**
- This device is used to read the information stored in the bar code marked on an object.
- 7. OMR (Optical Mark Reader)**
- This device is mainly used in the computer to check the multiple choice answer sheet of a candidate.
- 8. MICR (Magnetic Ink Character Reader/Recognition)**

- This device is used in the bank, with its help the numbers printed on a check with magnetic ink can be processed.
- MICR can read only ten digits and 4 special characters.
- MICR character can be read by both machine and human.

9. OCR (Optical Character Reader)

- This device is used to make the machine understandable by reading printed or handwritten letters on a question.
- OCR can read only one character at a time.

10. Smart Card Reader

- This device is used to read the information stored in the micro chip and magnetic chip in the smart card (Credit/Debit).

Output Devices

- This device is used to indicate the output provided by the computer.
- Output is provided by the output device in two forms.
 - (i) Soft Copy
 - (ii) Hard Copy

Note – The process of making the output provided by the processor understandable to the user is called decode.

The outputs are as follows -

1. Monitor / Screen/ Display / VDU (Visual Display Unit)

- The most popular output device in a computer, which is used to represent

the data provided by the computer in the form of soft copy.

- It is of three types -
 - (i) CRT – Cathode Ray Tube
 - (ii) Flat Panel Display
 - LED
 - LCD
 - (iii) Plasma Display Monitor

2. Speaker

- This device is used to provide audio output.

3. Projector

- This device is used to represent the multimedia file stored in the computer.

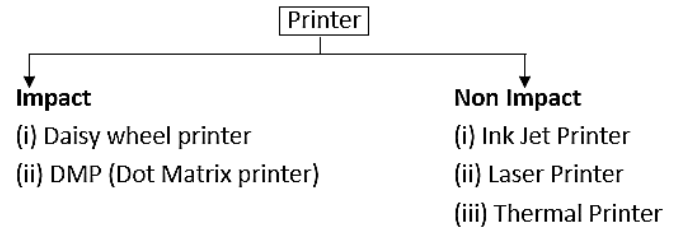
4. Plotter

- It is an output device working similar to a printer.

- Generally this output device is used for engineering works.

5. Printer

- This device is used to provide output in the form of hard copy.
- Printers are of two types on the basis of printing technology -



- Printer speed is measured in PPM (Page per minute).

